Impurity quantum phase transitions: a quantum information perspective

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Abstract

A quantum phase transition may occur in the ground state of a system at zero temperature when a controlling field or interaction is varied. The resulting quantum fluctuations which trigger the transition produce scaling behavior of various observables, governed by universal critical exponents. A particularly interesting class of such transitions appears in systems with quantum impurities where a non-extensive term in the free energy becomes singular at the critical point. Curiously, the notion of a conventional order parameter which exhibits scaling at the critical point is generically missing in these systems. Here, we explore the possibility of exploiting quantum information tools to characterize such phase transitions and reveal their scaling properties in both equilibrium and non-equilibrium situations.